Kyrgyz Agro-Input Enterprise Development Project

A Survey of the Customers of the Association of Agro-Businessmen of Kyrgyzstan

Prepared by

IFDC

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Survey of the Customers of the Association of Agro-Businessmen of Kyrgyzstan

Summary

The data on AAK customers and non-customers presented and discussed in this report serve as baseline data. When customers are compared to non-customers, the following salient differences emerged from the data.

Socio-Demographic Characteristics

- On average, non-customers (43.8 years) are younger than customers (46.3 years) (Table 2).
- Customers (25.0%) are more likely to have completed 15+ years of education than non-customers (18.7%) (Table 2).
- Customers are significantly more likely to have studied in the fields of finance, livestock, and agricultural machinery than non-customers (Table 2).
- Customers (39.7%) were significantly more likely than non-customers (28.0%) to be engaged in off-farm employment (Table 2).
- Household members of customers (21.8%) are significantly more likely than non-customers (15.0%) to be engaged in off-farm employment (Table 2).
- Household members of customers (3.5%) are more likely than non-customers (2.5%) to contribute on-farm agricultural labor (Table 2).
- Non-customers (6.7%) are significantly more likely than customers (2.9%) to receive remittances (Table 2).
- Total annual household off-farm income among customers ($337.40) is significantly greater than non-customers ($207.80) (Table 2).
- The number of persons per household among customers (4.5) is significantly greater than among non-customers (3.7).
- The mean age of household members of customers (25.9) is significantly less than non-customers (27.3).
- Customers (7.8 km) are significantly closer than non-customers (9.4 km) to markets to purchase inputs and sell farm produce (Table 4).

Land

- The total land area cultivated by customers (7.4 ha) is significantly greater than non-customers (1.6 ha) (Table 5).
- The percentage of customers renting land (48.5%) is significantly greater than among non-customers (32.0%) (Table 5).
- The mean land area rented by customers (12.5 ha) is significantly larger than non-customers (1.5 ha) (Table 5).
- Customers (7.5%) are significantly more likely than non-customers (4.0%) to cultivate state-owned land (Table 5).
- The mean state land area cultivated by customers (3.4 ha) is significantly greater than non-customers (1.0 ha) (Table 5).
- The mean irrigated land area cultivated by customers (4.8 ha) is significantly greater than among non-customers (1.2 ha) (Table 5).
- Non-customers (32.0%) compared to customers (20.7%) are significantly more likely to cultivate rainfed land (Table 5).
- The mean rainfed area cultivated by customers (12.2 ha) is significantly greater than non-customers (1.3 ha) (Table 5).
- The mean loan amount received by customers ($913.00) is significantly greater than non-customers ($442.60) (Table 6).

Fertilizer Use

- The percentage of customers using nitrogenous fertilizers (94.1%) is significantly greater than non-customers (86.7%) (Table 8).
- The percentage of customers using phosphatic fertilizers (13.2%) is significantly greater than non-customers (8.0%) (Table 5).
- Non-customers are significantly more likely than customers to apply N to carrots, potatoes, and wheat (Table 9).
- Customers are significantly more likely to apply N to cucumber than non-customers (Table 9).
- Customers are significantly more likely to apply P to cabbage, cucumber, rice, and tomato than non-customers (Table 10).

- Non-customers are more likely to apply P to carrot, maize, onion, sunflower, and wheat than customers (Table 10).
- Customers are more likely than non-customers to apply K to cabbage, potato, and tomato (Table 11).
- Non-customers are more likely than customers to apply K to cotton, onion, and wheat (Table 11).

Seed Sources

- Customers are significantly more likely than non-customers to purchase cabbage seed from dealers (Table 13).
- Non-customers are significantly more likely to use saved cabbage seed (Table 13).
- Non-customers are significantly more likely to use saved and bazaar cotton seed than customers (Table 13).
- Customers are significantly more likely than non-customers to use cotton seed purchased from dealers (Table 13).
- Non-customers are more likely to use saved cucumber seed and customers more likely to use bazaar seed (Table 13).
- Customers prefer onion seed from bazaars and non-customer prefer saved onion seed (Table 13).
- Non-customers prefer potato seed from bazaars and customer use potato seed from dealers (Table 13).
- Customers are significantly more likely than non-customers to purchase rice seed from dealers (Table 13).
- Non-customers prefer tomato seed from bazaars and customers are more likely to purchase tomato seed from dealers (Table 13).
- Non-customers prefer wheat seed from bazaars and customers are significantly more likely to purchase wheat seed from seed dealers (Table 13).

Crop Yields

- Customers' mean yields of cotton (1,949 kg/ha) are significantly greater than non-customers' (1,738 kg/ha).
- Customers' mean onion yields (24,762 kgh/a) are significantly greater than non-customers' (19,643 kg/ha).
- Mean rice yields among customers (3,542 kg/ha) are significantly greater than non-customers (2,190 kg/ha) (Table 15).
- Mean sunflower yields among customers (2,231 kg/ha) are significantly greater than among non-customers (1,622 kg/ha) (Table 15).
- Mean tomato yields among customers (19,690 kg/ha) are significantly greater than non-customers (14,917 kg/ha).
- The total revenue from the sale of farm produce among customers ($76,579.20) is substantially greater than non-customers ($34,368.80) (Table 19).
- The mean revenue from the sale of farm produce among customers ($1,160.29) is significantly greater than non-customers (458.18) (Table 19).
- The mean revenue per household member from the sale of farm produce is significantly greater among customers ($221.36) than non-customers ($111.23) (Table 19).

Gender

- Women in non-customer households (19.0%) are significantly more likely than women in customer households (14.0%) to be responsible for selling farm produce (Table 20).
- The number of men per 100 women in non-customer households (76) is significantly less than in customer households (81) (Table 21).

Introduction

The Kyrgyz Agro-input Enterprise Development (KAED) project aims to improve the productivity and profitability of agriculture in southern Kyrgyzstan by developing and strengthening the agri-input sub-sector. The purpose of the Association of Agro-Businessmen of Kyrgyzstan (AAK) customer survey is to create a baseline data set that describes the agricultural input use of AAK customers compared to that of non-customers. Non-customers are those farmers, usually neighbors of AAK customers, who purchase inputs and obtain advice from sources other than AAK dealers or use little or no inputs. This report presents baseline data that will be used to document change, development, and benefits of purchasing and using agricultural inputs from of the AAK dealers through 2005. It is the establishment of a business relationship with AAK dealers that is the principal difference between customers and non-customers.

Methodology and Sample

Methodology

The questionnaire for customers of AAK and non-customers consists of 14 questions and is based on interviews with 68 customers and 75 non-customers. The sample was surveyed in three oblasts of Southern Kyrgyzstan during the period October 31, 2003, to December 26, 2003.

Table 1. Distribution of Customers and Non-Customers Surveyed by Oblast in 2003

Oblast	Customer		Non-Customer	
	Number	Percent	Number	Percent
Osh	34	50	39	57
Jalal-Abad	24	35	22	32
Batken	10	15	14	21
Total	68	100	75	100

The Questionnaire

The major variables included in the questionnaire to assess differences between AAK customers and non-customers are: socio-demographic information about the farmer, farm labor, household composition, information about the farm, household consumption of farm produce,

household gender composition, produce marketing by gender, distances to market and fields, land use and tenure, credit, input use by crop, source of seed, crop production and yields, sale of farm products, and remittances received by farmers. Each interview required 15-30 minutes to complete.

Analytical Procedure

The differences between AAK customers and non-customers are presented as percentages and means. The differences are analyzed by the use of a one-tailed t-test and assume unequal variances. A difference between customers and non-customers on any particular variable is evaluated by the value of P(T<=t). The value of .20 or less is used here to indicate the level of statistical significance associated with the observed difference between customers and non-customers, that is the probability of rejecting the hypothesis that difference=0 with the alternative hypothesis difference > 0. The lower this number, the greater is the probability that there is an actual difference between costumers and non-costumers. For example, a value of .21 or greater indicates that a difference may actually exist, but with less probability of being certain and a greater probability of being wrong. This criteria and the 0.20 “cut off” point is used here to describe and discuss differences between AAK customers and non-customers throughout this report and are shown in bold font in the tables. Differences between variable values for customers and non-customers are absolute.

Socio-Demographic Characteristics

Age

As shown in Table 2, AAK customers are on average significantly older (46.3) than non-customers (43.8).

Education

Compared to non-customers (18.7%), customers (25.0%) are significantly more likely to have completed study in higher education of 15 years or more. Compared to customers (44.1%),

non-customers (53.3%) are significantly more likely to have completed a secondary of 8-10 years. No significant difference is observed for secondary-special education of 12-14 years.

Table 2. A Comparison of the Socioeconomic Characteristics of AAK Customers and Non-Customers in 2003

Characteristic	Customer	Non-Customer	Difference	P (%<=t) One-Tail
Age of Farmer (Mean Years)	46.3	43.8	2.5	**0.15**
Education of Farmers				
Secondary (8-10 years) (%)	44.1	53.3	(-9.2)	**0.14**
Secondary-Special (12-14 years) (%)	30.9	28.0	2.9	0.35
Higher (15 years or more) (%)	25.0	18.7	6.3	**0.18**
Field of Study				
Crop production (%)	7.4	6. 7	0.7	0.44
Finance (%)	11.8	5.3	6.5	**0.10**
Livestock (%)	1.5	0.1	1.4	**0.17**
Agricultural Machinery (%)	22.1	12.0	10.1	**0.06**
Other (%)	13.2	16.0	(-2.8)	0.32
Experience in Farming (Mean Years)	7.4	6. 7	0.7	0.44

Field of Study

Continuing with Table 2, compared to non-customers (5.3%), AAK customers (11.8 %) are significantly more likely to have studied in the field of finance. This also the case for study in the area of livestock, 1.57% and 0.1%, respectively. The most significant difference in fields of study among customers and non-customers is in the area of agricultural machinery. Compared to non-customers (12.0%), customers (22.1%) are far more likely to have completed studies in that field. In regard to livestock studies, the number of case is too small to draw meaningful conclusions. No other significant differences in fields of study were observed

Experience in Farming

Finally, Table 2 shows that compared to customers, (7.2 years), non-customers (7.8 years) have significantly greater experience in farming.

Table 3 presents data to make further comparisons between AAK customers and non-customers on off-farm employment, demographic, and income characteristics in the baseline

survey for 2003.

Off-Farm Employment of Farmers

Although there is no significant difference in mean annual off-farm income or duration of off-farm employment, compared to non-customers (28.0%), customers (39.7%) more frequently engaged in off-farm employment.

Table 3. A Comparison of the Off-Farm Employment, Household, Labor, Demographic, and Income Characteristics of AAK Customers and Non-Customers in 2003

Characteristic	Customer	Non-Customer	Difference	P (T<-t) One-Tail
Off-Farm Employment of Farmers (%)	39.7	28.0	11.7	**0.07**
Annual Off-Farm Income of Farmers (Mean US $)	372.0	344.0	28.0	0.40
Months of Off-Farm Employment of Farmers (Mean)	9.4	10.0	(-0.6)	0.31
Household Members, 16-60 years of age Employed Off-Farm (%)	21.8	15.0	6.8	**0.04**
Household Members Months of Off-Farm Employment of (Mean)	9.1	10.6	(-1.5)	**0.03**
Household Members Annual Off-Farm Income of (Mean US $)	258.6	246.3	12.3	0.41
Female Household Members Months of Off-Farm Employment of (Mean)	9. 7	10.4	(-0.7)	0.28
Female Household Members (16-60 years) Employed Off-Farm (%)	17.0	14.7	2.3	0.31
Female Household Members Annual Off-Farm Income (Mean US $)	147.9	161.8	(-13.9)	0.36
Household Members providing on-farm labor (Mean)	3.5	2.5	1.0	**0.002**
Remittance Received by Farmers (%)	2.9	6.7	(-3.8)	**0.15**
Remittance Received Annually by Farmers (Mean US $)	114.1	193.9	(-79.8)	0.23
Total Annual Household Off-Farm Income (Mean US $)	337.4	207.8	129.6	**0.05**
Persons per Household (Mean)	4.5	3.7	0.8	**0.03**
Age of Household Members (Mean)	25.9	27.3	(-1.4)	**0.14**

Off-Farm Employment of Household Members

The percentage of household members employed off-farm among AAK customers (21.8%) is significantly and substantially greater than non-customers (15.0%). However, the mean of the number of months that household members are employed off-farm among non-customers (10.6) is significantly greater than among AAK customers (9.1). Although the mean annual off-farm income of household members of customers $258.6 is greater than that of non-customers $246.3, the difference is not significant by the .20 rule used in this report.

Off-Farm Employment of Female Household Members

In regard to employment characteristics of female household members, the data in table 3

show no significant differences between customers and non-customers. These characteristics will continue to be subjects of monitoring over the life of the project because input use and the associated benefits may influence these employment characteristics of female household members over time.

Household Labor

The mean number of household members providing on-farm labor among AAK customers (3.5) is significantly greater than among non customers (2.5). This is attributable to larger household sizes and accompanying age structure among customers and enhances the benefits of farm work and the ability to use inputs and handle outputs.

Remittances

The data in Table 3 show that the percentage of non-customers who reported receipt of remittances in the baseline year of 2003 (6.7%) is significantly greater than that of AAK customers (2.9%). The mean annual remittance received by non-customers ($193.9) is substantially greater that of AAK customers ($114.1). Although the P (T<=t) one-tail value of .23 slightly exceeds the .20 rule established here, this difference deserves notation and continued monitoring.

Total Annual Household Off-Farm Income

The total mean annual household off-farm income of customers ($337.4) was significantly and substantially greater than that of non-customers ($207.8) in 2003. Thus, compared to non-customers, customers have a greater financial means to purchase agricultural inputs.

Household Size and Age

Finally in regard to Table 3, the mean household size of customers (4.5) is significantly greater than that of non-customers (3.7). The mean age of household members of customers (25.9) is significantly less than that of non-customers (27.3). Thus, compared to non-customers, the household members of customers are significantly larger and younger.

Distance From Household to Fields and Markets

The data in Table 4 compare the distances from households to field and market among

AAK customers and non-customers in 2003. The distance from household to field among customers (3.3 km) is not significantly different from that of non-customers (3.6 km). However the distance from households to market where inputs are purchased and farm produce is sold is substantially and significantly less among customers (7.8 km) compared to non-customers (9.4 km). That distance appears to be a constraint to the purchase and use of inputs among non-customers.

Table 4. A Comparison of the Distance from Household to Fields and Markets among AAK Customers and Non-Customers in 2003

Distance	Customer	Non-Customer	Difference	P (T<=t) One-tail
From home to field (Mean km)	3.3	3.6	(-0.3)	0.35
From home to market (Mean km)	7.8	9.4	(-1.6)	0.15

Land Cultivation and Tenure

Total Land Area Cultivated

As shown in Table 5, the total mean land area cultivated by AAK customers (7.3 ha) in the baseline year of 2003 was substantially and significantly greater than among non-customers (1.6 ha).

Cultivation of Owned Land

There were no significant differences between percentages of customers (95.6%) and non-customers (97.3%) cultivating owned land. There is also no notable difference in the mean land areas owned by customers (1.0 ha) and non-customers (1.1 ha).

Table 5. A Comparison of Land Cultivated by AAK Customers and Non-Customers in 2003

Characteristic	Customer	Non-Customer	Difference	P(T<=t) One-Tail
Total Land Area Cultivated (Mean ha)	7.4	1.6	5.8	**0.10**
Farmers Cultivating Owned land (%)	95.6	97.3	(-1.7)	0.29
Area of Owned Land (Mean ha)	1.0	1.1	(-0.1)	0.26
Farmers Cultivating Rented land (%)	48.5	32.0	16.5	**0.02**
Rented Land Area (Mean ha)	12.5	1.5	11.0	**0.12**
Farmers Cultivating State Land (%)	7.5	4.0	3.5	**0.20**
State Land Area (Mean ha)	3.4	1.0	2.4	**0.06**
Farmers Cultivating Irrigated Land (%)	98.5	98.7	(-0.2)	0.47
Irrigated Land Area (Mean ha)	4.8	1.2	3.6	**0.07**
Farmers Cultivating Rainfed Land (%)	20.7	32.0	(-11.3)	**0.06**
Rainfed Land Area (Mean ha)	12.2	1.3	10.9	**0.17**
Irrigated Land Rental Price (Mean US $/ha)	104.5	103.2	1.3	0.47
Rainfed Land Rental Price (Mean US $/ha)	22.4	15.2	7.2	0.33

Cultivation of Rented Land

Continuing with Table 5, compared to non-customers (32.0%), customers of AAK input dealers (48.5%) are significantly more likely to rent land for crop cultivation. Further, the mean land area rented by customers (12.5 ha) is significantly and substantially greater than among non-customers (1.5 ha).

Cultivation of State Land

The percentage of customers cultivating land owned by the state (7.5%) is substantially and significantly greater than among non-customers (4.0%). The mean state land area cultivated by AAK customers (3.4 ha) is also significantly greater than among non-customers (1.0 ha).

Cultivation of Rainfed and Irrigated Land

As shown further in Table 5, compared to AAK customers (20.7%)**,** a significantly greater percentage of non-customers (32.0%) cultivate Rainfed land. However, the mean Rainfed area cultivated by customers (12.2 ha) is substantially and significantly greater than among non-customers (1.3 ha). There is virtually no difference between the percentage of customers (98.5%) and non-customers (98.7%) who reported cultivation of irrigated land. However, the mean irrigated area cultivated by customers (4.8 ha) is significantly greater than among non-customers (1.2 ha).

Land Rental Prices

Concerning land rental prices, no notable or significant differences between customers and non-customers were observed. The mean rental price for irrigated land ranged from $103.2/ha for non-customers to $104.5/ha for AAK customers. The rental prices for Rainfed land were $15.2 and $22.4, respectively.

Agricultural Credit

Table 6 shows a comparison of agricultural loans received by AAK customers and non-customers in 2003. No significant difference in the percentages of customers (10.3%) and non-customers (9.3%) receiving loans were reported in the survey. Among those who received loans, the mean amount for customers ($913.0) was significantly greater than among non-customers ($442.6).

Table 6. A Comparison of Agricultural Loans Received by AAK Customers and Non-Customers in 2003

Loan Characteristic	Customer	Non-Customer	Difference	P (T<=t) One-Tail
Farmers receiving Loan (%)	10.3	9.3	1.0	0.42
Loan Amount (Mean US $)	913.0	442.6	470.4	**0.01**

The sources of credit received by AAK customers and non-customers in 2003 are shown in Table 7. Only 7 customers and 7 non-customers reported receiving an agricultural loan in

2003. The Kyrgyz Agricultural Finance Corporation was the source of 57.0% of all loans reported, followed by ACTED (14.3%), credit unions (14.3%), Bai Tushum Credit Company (7.2%), and the Rural Advisory Service (7.2%). From all sources, the total amount loaned to customers was $6,392 and $3,098 to non-customers. The Bai Tushum Credit Company, credit unions, and the Kyrgyz Agricultural Finance Corporation were the main sources of credit for customers. Among non-customers, Kyrgyz Agricultural Finance Corporation, Rural Advisory Service, ACTED, and credit unions were the main sources of credit.

Table 7. The Sources of Credit Received by AAK Customers and Non Customers in 2003

Lender	Number of Farmers Receiving Loan		Total Amount of Loan ($US)		Average Amount of Loan	
	Customer	Non-Customer	Customer	Non-Customer	Customer	Non-Customer
ACTED[a]	0	2	0	359	-	179
Bai Tushum Credit Company	1	0	870	0	870	-
Credit Unions	1	1	652	65	652	65
Kyrgyz Agricultural Finance Corporation	5	3	4870	2500	974	833
Rural Advisory Service	0	1		174	-	174
Total	7	7	6392	3098		

a. Agency for Technical Cooperation and Development.

Fertilizer Use

The data on fertilizer use by type among AAK customers and non-customers in 2003 are presented in Table 8. Customers (94.1%) are significantly more likely than non-customers (86.7%) to use nitrogenous fertilizer products. Although to a lesser extent, this observation also holds for phosphatic products, where use reported by customers (13.2%) is significantly greater than non-customers (8.0%). The use of potassic products was minimal by customers and non-customers with no significant difference reported in 2003.

Table 8. Fertilizer Use by Type of Product among AAK Customers and Non-Customers in 2003

Type of Fertilizer Product	Customer	Non-Customer	Difference	P(T<=t) One-Tail
Nitrogenous (%)	94.1	86.7	7.4	**0.07**
Phosphatic (%)	13.2	8.0	5.2	**0.16**
Potassic (%)	2.9	2.7	0.2	0.46

Nitrogenous Fertilizer (N)

Of all irrigated crops shown in Table 9, significant differences in N applied by customers and non-customers were observed for carrot, cucumber, potato, and wheat. Specifically, on average non-customers applied significantly greater rates of N for carrot (324.8 kg/ha) than customers (91.2 kg/ha). In contrast, on average customers applied significantly greater rates of N for cucumber (113.0 kg/ha) compared to non-customers (13.8 kg/ha). Again on average, compared to AAK customers (258.9kg/ha), non-customers (341.1 kg/ha) applied significantly greater rates of N for potato in 2003. Finally, in regard to table 9, compared to AAK customers (116.9 kg/ha), non-customers (135.1kg/ha) applied significantly greater rates of N for wheat in 2003.

These data show that AAK customers differed significantly from non-customers and favored cucumber for application of nutrient N in 2003. In sharp contrast to customers, non-customers significantly favored carrot, potato, and wheat for application of nutrient N.

Table 9. A Comparison of Nutrient N Applied by AAK Customers and Non-Customers on Irrigated Land by Crop in 2003

Crop	Mean, kg N/ha		Difference	P(T<=t) One-Tail
	Customer	Non-Customer		
Cabbage	79.5	92.6	(-13.1)	0.44
Carrot	91.2	324.8	(-233.6)	**0.08**
Cotton	151.4	162.8	(-11.4)	0.28
Cucumber	113.0	13.8	99.2	**0.09**
Maize	86.5	92.8	(-6.3)	0.40
Onion	294.3	381.5	(-87.2)	0.34
Potato	258.9	341.1	(-82.2)	**0.10**
Rice	152.6	200.6	(-48.0)	0.31
Sunflower	145.3	98.0	47.3	0.28
Tomato	100.9	79.7	21.2	0.32
Wheat	116.9	135.1	(-18.2)	**0.18**

Phosphatic Fertilizer (P)

Of all irrigated crops shown in Table 10, significant differences in mean nutrient P applied by customers and non-customers were observed for cabbage, carrot, cucumber, maize, onion, rice, and sunflower. Compared to non-customers, customers are significantly more likely to apply greater rates of nutrient P on irrigated cabbage, cucumber, rice, and tomato.

Table 10. A Comparison of Nutrient P Applied by AAK Customers and Non-Customers in Irrigated Land by Crop in 2003

Crop	Mean, kg P/ha		Difference	P(T<=t) One-Tail
	Customer	Non-Customer		
Cabbage	31.2	0.0	31.2	**0.20**
Carrot	0.0	18.0	(-18.0)	**0.18**
Cotton	7.4	14.6	(-7.2)	0.31
Cucumber	32.5	0.0	32.5	**0.20**
Maize	0.0	4.8	(-4.8)	**0.16**
Onion	0.0	21.7	(-21.7)	**0.17**
Potato	36.6	22.1	14.5	0.29
Rice	2.9	0.0	2.9	**0.17**
Sunflower	0.0	4.1	(-4.1)	**0.16**
Tomato	83.6	12.8	70.8	**0.18**
Wheat	2.8	13.8	(-11.0)	**0.13**

Non-customers reported the cultivation of irrigated cabbage, cucumber, and rice without P application in 2003. Of course, that practice makes the mean rate of P application on these crops significant among AAK customers. On average, customers applied significantly and substantially greater rates of nutrient P on irrigated tomato (83.6 kg/ha) than non-customers (12.8 kg/ha). Compared to AAK customers, non-customers applied significantly greater mean rates of nutrient P on carrot, maize, onion, sunflower, and wheat in 2003.

Potassic Fertilizer (K)

The data in Table 11 show a comparison of nutrient K applied by AAK customers and non-customers in irrigated land by crop in 2003. As shown before in Table 8, potassic fertilizer is not widely used by those interviewed in the survey. In any case, the favored crops for K application among customers that are significantly different from non-customers include cabbage, potato, and tomato. Compared to AAK customers, non-customers apply significantly greater rates of nutrient K for cotton, onion, and wheat.

Table 11. A Comparison of Nutrient K Applied by AAK Customers and Non-Customers in Irrigated Land by Crop in 2003

Crop	Mean, kg/ha		Difference	P(T<=t) One-Tail
	Customer	Non-Customer		
Cabbage	31.2	0.0	31.2	**0.20**
Cotton	0.0	1.3	(-1.3)	**0.16**
Cucumber	32.5	0.0	32.5	0.21
Onion	0.0	21.7	(-21.7)	**0.17**
Potato	7.6	2.6	5.0	**0.20**
Tomato	9.3	0.0	9.3	**0.17**
Wheat	0.0	0.8	(-0.8)	**0.16**

Nutrient N Use on Rainfed Sunflower and Wheat

The data in Table 12 show that compared to AAK customers, non-customers apply substantially and significantly more nutrient N to Rainfed sunflower and wheat.

Table 12. A Comparison of Nutrient N Applied by AAK Customers and Non-Customers in Rainfed Land for Sunflower and Wheat in 2003

Crop	Mean, kg/ha		Difference	P(T<=t) One-Tail
	Customer	Non-Customer		
Sunflower	0.0	23.2	(-23.2)	**0.08**
Wheat	11.0	43.2	(-32.2)	**0.02**

Seed Sources for Irrigated Crops

In Table 13, the sources of seed among AAK customers and non-customers for various irrigated crops are shown. The distinct sources are own seed (that saved by farmers), bazaar purchases, and seed dealers. Note that seed purchased at bazaars is often that saved by farmers. Compared to saved and bazaar seed, the seed from seed dealers is likely the best quality. Distinct and significant differences in the sources of seed purchased by AAK customers and non-customers were observed for cabbage, cotton, cucumber, onion, potato, rice, tomato, and wheat.

The choice of a source to purchase seed is guided by perceived quality and convenience of the location of sale.

Cabbage

Although AAK customers and non-customers purchase the majority of cabbage seed from seed dealers, compared to non-customers (66.7%), customers (100.0%) are significantly more likely to purchase cabbage seed from seed dealers. Only non-customers (33.3%) use their own saved seed and that behavior is significantly different from customers.

Cotton

Compared to customers (2.7%), non-customers (13.1%) are significantly more likely to use their own saved cotton seed. In contrast to customers (16.2%), non-customers are also more likely to purchase cotton seed from a bazaar (56.5%). A majority of customers (81.1%) buy seed from dealers compared to of non-customers (30.0%), a significant difference.

Cucumber

Concerning cucumber seed, customers (50.0%) and non-customers (50.0%) are equally as likely to purchase seed from dealers. However, non-customers (50.0%) are significantly more likely to use their own saved cucumber seed and customers (50.0%) are significantly more likely to purchase such seed from a bazaar. Recall that own saved seed and bazaar seed are often that saved by farmers.

Maize

No significant differences between AAK customers and non-customers were observed in their choices of sources to purchase maize seed.

Onion

AAK customers (71.4%) are significantly more likely than non-customers (33.3%) to purchase onion seed from a bazaar but non-customers (33.3%) are significantly more likely than customers (14.3%) to purchase that seed from a seed dealer.

Potato

Further in regard to Table 13, sharp and very significant differences in choices of sources to purchase potato seed were observed between AAK customers and non-customers. Compared to customers (27.8%), non-customers (80.0%) overwhelmingly prefer a bazaar for potato seed purchases. Non-customers purchased no potato seed from seed dealers but customers (55.0%) prefer that source over bazaar purchases (27.8%) and saved seed (16.7%).

Table 13. A Comparison of Sources of Seed Purchases Among AAK Customers and Non-Customers in Irrigated Land by Type in 2003

Seed	Source of Seed	Percent of Farmers		Difference	P(T<=t) One-Tail
		Customer	Non-Customer		
Cabbage	Own	0.0	33.3	(-33.3)	**0.15**
	Seed dealer	100.0	66.7	33.3	**0.11**
Carrot	Bazaar	75.0	75.0	0.0	0.50
	Seed dealer	25.0	25.0	0.0	0.50
Cotton	Own	2.7	13.1	(-10.4)	**0.09**
	Bazaar	16.2	56. 5	(-40.3)	**0.001**
	Seed dealer	81.1	30.4	50.7	**0.003**
Cucumber	Own	0.0	50.0	(-50.0)	**0.15**
	Bazaar	50.0	0.0	50.0	**0.07**
	Seed dealer	50.0	50.0	0.0	0.50
Maize	Own	28.5	31.3	(-2.8)	0.44
	Bazaar	42.9	56.3	(-13.4)	0.26
	Seed dealer	28.6	12.5	16.1	0.23
Onion	Own	14.3	33.3	(-19.0)	0.27
	Bazaar	71.4	33.3	38.1	**0.08**
	Seed dealer	14.3	33.3	(-19.0)	**0.13**
Potato	Own	16.7	20.0	(-3.3)	0.40
	Bazaar	27.8	80.0	(-52.2)	**0.001**
	Seed dealer	55.6	0.0	55.6	**0.001**
Rice	Own	77.8	75.0	2.8	0.46
	Bazaar	11.1	25.0	(-13.9)	0.28
	Seed dealer	11.1	0.0	11.1	**0.14**
Sunflower	Own	44.4	28.6	15.8	0.22
	Bazaar	55.6	71.4	(15.8)	0.25
Tomato	Own	28.5	16.7	11.8	0.31
	Bazaar	28.6	66.6	(-38.0)	**0.01**
	Seed dealer	42..9	16.7	26.2	**0.04**
Wheat	Own	37.5	41.2	(-3.7)	0.38
	Bazaar	9.4	38.2	(-28.8)	**0.01**
	Seed dealer	53.1	20.6	32.5	**0.05**

Rice

About three-fourths of customers (77.8%) and non-customers (75.0%) save their own rice seed or purchase that seed from a bazaar, 11.1% and 25.0%, respectively. No significant differences in purchases from these sources were observed. Customers are, however, substantially and significantly more likely than non-customers (0.0 %) to purchase rice seed from dealers (11.1%).

Tomato

AAK customers and non-customers differ substantially and significantly in their choices of sources to purchase tomato seed. Compared to customers (28.6%), non-customers (66.6%) prefer to purchase tomato seed from a bazaar. In sharp and significant contrast, customers (42.9%) are more likely than non-customers (16.7%) to make such purchases from seed dealers.

Wheat

Finally in regard to Table 13, non-customers (38.2%) are significantly more likely than AAK customers (9.4%) to purchase tomato seed from a bazaar. About one-half of customers (53.1%) make such purchases from seed dealers which is significantly greater than non-customers (20.6%).

Seed Sources for Rainfed Crops

Sunflower

The data in Table 14 show no significant or notable differences between AAK customers and non-customers in regard to the preferred sources to purchase sunflower seed for rainfed cultivation.

Table 14. A Comparison of Seed Sources for Rainfed Sunflower and Wheat Among AAK Customers and Non-Customers in 2003

Crop	Source of seeds	Percent of Farmers		Difference	P(T<=t) One-Tail
		Customer	Non-Customer		
Sunflower	Own	75.0	66.7	8.3	0.38
	Bazaar	25.0	33.3	(-8.3)	0.44
Wheat	Own	75.0	43.8	31.2	**0.06**
	Bazaar	12.5	37.5	(-25.0)	**0.20**
	Seed dealer	12.5	18.7	(-6.3)	0.45

Wheat

Customers (12.5%) and non-customers (18.7%) are about equally as likely to purchase wheat seed from seed dealers. Interestingly and of significant difference, compared to non-customers (43.8%) AAK customers (75.0%) rely heavily on their own wheat seed for Rainfed cultivation. Significantly, customers (12.5%) rely less on wheat seed from bazaars than non-customers (37.5%)

Crop Yields on Irrigated Land

The data in Table 15 show the yields of AAK customers are significantly and substantially greater than those of non-customers for irrigated cotton, onion, rice, sunflower, and tomato. In absolute terms, in no case were the yields of other crops of non-customers greater than those of AAK customers.

Table 15. A Comparison of Yields Obtained by AAK Customers and Non-Customers in Irrigated Land by Crop in 2003

Crop	Mean (Kg/ha)		Difference (kg/ha)	P(T<=t) One-tail
	Customer	Non-Customer		
Alfalfa	6,367	4,241	2,126	0.30
Cabbage	10,500	8,722	1,778	0.44
Carrot	33,388	25,402	7,986	0.32
Cotton	1,949	1,738	211	**0.08**
Cucumber	4,125	3,333	792	0.40
Maize	5,627	5,108	519	0.27
Onion	24,762	19,643	5,119	**0.20**
Potato	18,456	17,966	490	0.43
Rice	3,542	2,190	1,352	**0.04**
Sunflower	2,231	1,622	609	**0.13**
Tomato	19,690	14,917	4,773	**0.13**
Wheat	3,580	3,576	4	0.50

Crop Yields on Rainfed Land

Table 17 shows that there were no significant differences between AAK customers and non-customers in the yields of Rainfed sunflower and wheat in the baseline year of 2003.

Table 17. A Comparison of Yield obtained by AAK Customers and Non-Customers in Rainfed Land in 2003

Crop	Mean, kg/ha		Difference kg/ha	P(T<=t) One-tail
	Customer	Non-Customer		
Sunflower	1,625	1,429	196	0.40
Wheat	1,889	2,134	(-245)	0.77

Sales of Farm Produce

The data in Table 19 show a comparison of revenue from the sale of farm products by AAK customers and non-customers in 2003. The total revenue realized by customers ($76,579.20) substantially and significantly exceeds that reported by non-customers ($34,368.80). The mean revenue realized by customers ($1,160.29) also significantly exceeds that reported by non-customers ($458.18). A more sensitive measure of the economic benefits of such sales is also evident in the mean revenue per household member where that of customers ($221.36) is significantly greater than that of non-customers ($111.23).

Table 19. A Comparison of Revenue from the Sale of Farm Products by AAK Customers and Non-Customers in 2003*

Revenue	Customer	Non-Customer	Difference	P (T<=t) One-Tail
Total (US $)	76,579.20	34,368.80	42,210.40	-
Mean (US $)	1,160.29	458.18	702.11	0.001
(Mean US $) per household Member	221.36	111.23	110.13	0.01

*These data exclude 2 customers whose revenues were excessively anomalous and unrepresentative.

Gender and Sales of Farm Produce

Table 20 shows that there is no significant difference in the percentages of household members of customers (64.4%) and non-customers (61.5%) who made no sales of farm produce in the baseline year of 2003. There is also no significant difference in the percentages of males in customer households (21.6%) and males in non-customer households (19.5%) who sell farm produce. It is among females that differences in sales emerge. Females in the households of non-customers (19.0%) are significantly more likely than their counterparts in customer households (14.0%) to be engaged in selling farm products.

Table 20. A Comparison of Household Members Engaged in Selling Farm Products by Gender in 2003

Gender of Seller	Customer	Non-Customer	Difference	P (T<=t) One-Tail
No Sales (%)	64.4	61.5	2.8	0.27
Men (%)	21.6	19.5	2.1	0.29
Women (%)	14.0	19.0	(-5.0)	**0.09**
Total	100.0	100.0		

The data on household gender composition and ratios aged 15-65 in Table 21 indeed show a lower gender ratio for non-customers (76) than for customer households (81). This partially explains the greater participation of non-customer females in the sale of farm products.

Table 21. Gender Composition and Ratios for Household Members of AAK Customers and Non-Customers Aged 15-65 in 2003

Gender	Customer	Non-Customer
Men (%)	44.8	43.3
Women (%)	55.2	56.7
Gender Ratio	81	76

The gender ratio is defined as the number of men per 100 women.